

REMARKS

In this Amendment, Applicant has amended Claim 11 to rephrase certain expression. It is respectfully submitted that no new matter has been introduced by the amended claims. All claims are now present for examination and favorable reconsideration is respectfully requested in view of the preceding amendments and the following comments.

REJECTIONS UNDER 35 U.S.C. § 103:

Claims 11 – 14 have been rejected under 35 U.S.C. § 103, as allegedly being obvious and unpatentable over Halliyal et al. (US 6,319,775), hereinafter Halliyal, in view of Walker (US 5,371,027), hereinafter Walker. Claims 11 – 13 have been rejected under 35 U.S.C. § 103, as allegedly being obvious and unpatentable over Chen et al. (US 2003/0232507), hereinafter Chen, in view of Walker. Claim 15 has been rejected under 35 U.S.C. § 103, as allegedly being obvious and unpatentable over Halliyal in view of Walker and further in view of Naguib et al. (US 4,683,645). Claim 16 has been rejected under 35 U.S.C. § 103, as allegedly being obvious and unpatentable over Halliyal in view of Walker and further in view of Bryant et al. (US Appl. 2005/0245009).

Applicant traverses the rejection. It is respectfully submitted that the cited references fail to render the embodiments of the present invention as claim obvious. More specifically, the combination of Halliyal or Chen with Walker, Naguib or Bryant does not disclose all the limitations of the embodiments of the present invention as defined in Claims 11 – 14, especially the feature of “the gate dielectric layer has **an increased electron trapping density** and has at least one kind of hetero element, other than Nitrogen”, “Germanium” in Claim 15 and “Oxygen” in Claim 16. In addition, there is no motivation in the prior art to combine these references to achieve the present invention. The mere fact that references can be combined or modified does not render the

resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990)

The embodiments of the present invention as defined in Claims 11 – 16 are significantly different from Halliyal, which discloses an “ONO” EEPROM process including “first silicon oxide layer”, “silicon nitride layer”, “second silicon oxide layer”, their related thermal CVD, thermal oxidation and thermal nitridation. Halliyal does not disclose or suggest any process to **increase the electron trapping density**. However, the embodiments of the present invention as defined in Claims 11 – 16 include the feature of “the gate dielectric layer has **an increased electron trapping density**.”

Similarly, Walker does not disclose or suggest this feature of “the gate dielectric layer has an increased electron trapping density.” Walker focuses on the enhancement of tunneling current in oxide rather than the charge trapping capability. These two characters are completely different. According to Walker, “... *the tunneling effect is enhanced by implantation of a heavy, high-energy ion, for example As, into a comparatively thin poly layer of the oxide. During this, Si atoms are propelled from the polylayer into the oxide, so that the oxide is enriched with Si, which causes a major change in the tunnelling characteristics ...*” (Abstract). Therefore, Walker does not teach or suggest “the gate dielectric layer has an increased electron trapping density.” Without such motivation to combine Halliyal with Walker and reasonable expectation of success, there is no *prima facie* case of obviousness against the present application.

In addition, the disclosure of Chen focuses on a **nitrogen** plasma treatment process to prevent ONO damages from alter chemical processes. According to Chen, “*the process involves exposing the exposed surface of the top layer of the multi-layer film to a plasma containing nitrogen radicals, to form a nitrided layer of oxide on the exposed surface*” (Abstract). Applicant respectfully submits that it is incorrect to equalize the hetero elements having increased oxide bulk’s electron trapping density in the present application to the nitrided surface treatment of Chen. In the embodiments of the present invention as defined in Claims 11 – 13, the hetero element exists in the gate oxide bulk,

capable of storing electrons or electric charges. On the contrary, Chen discloses a plasma surface treatment for preventing exposed top ONO surface from damages where **no feature of increased charge trapping density has been disclosed or suggested.** Without such motivation to combine Chen with Walker and reasonable expectation of success, there is no *prima facie* case of obviousness against the present application.

As to Naguib, it discloses “*...implanting germanium ions at the source and drain areas to mix silicon and the refractory metal at an interface therebetween; implanting silicon ions at the source and drain areas to cause amorphization of the silicon to a predetermined depth...*” (claim 1). Naguib emphasizes the usage of ion implantations to mix materials of silicon and metals or amorphization of silicon mainly at the source and drain regions. The hetero element implantation in the present invention is used for **increasing charge trapping** purpose in the gate dielectric under the gate electrode and is completely different from Naguib in terms of implanted objects and purposes. It would not be possible to combine Halliyal’s, Walker’s and Naguib’s inventions to accomplish the improvement of electron trapping density in the present invention.

As to Bryant, Applicant respectfully submits that Bryant cannot be used as a prior art reference under 35 U.S.C. 103(a). According to MPEP 2141.01, "Before answering *Graham's 'content' inquiry*, it must be known whether a patent or publication is in the prior art under 35 U.S.C. § 102." *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1568, 1 USPQ2d 1593, 1597 (Fed. Cir.), *cert. denied*, 481 U.S. 1052 (1987). Because Bryan has the filing date of April 28, 2004 and publication date of November 3, 2005, both later than the priority date (December 2, 2003) and filing date (January 16, 2004) of the present application. Therefore, Bryant is not eligible as a prior art under any section of 35 U.S.C. 102, thus not eligible as prior art reference under 35 U.S.C. 103(a). It is respectfully submitted that a copy of the priority document of the present application was properly submitted on July 29, 2004 (copies of priority document, transmittal letter and postcard are enclosed). Applicant respectfully request the Examiner properly recognize and acknowledge the foreign priority of the present application under 35 U.S.C. 119.

In addition, Bryant discloses "...introducing a first impurity on the first side of the fin having first and second sides; forming a dielectric layer on the first and second sides, wherein the dielectric layer is thicker on one of the first and second sides than the other of the first and second sides, and the introduced impurity affects dielectric layer thickness..."(claim 1). Bryant emphasized the usage of ion implantations to alter the dielectric thickness. A semiconductor fin is the object to be implanted in Bryant's invention. The hetero element implantation in the present invention is used for increasing charge trapping purpose in the gate dielectric under the gate electrode and is obviously different from Bryant's invention in terms of implanted objects and purposes. It would not be possible to combine Halliyal's, Walker's and Bryant's inventions to accomplish the improvement of electron trapping density in the present invention.

In summary, nowhere in prior art has suggestion or incentive to combine Halliyal or Chen with Walker Naguib or Bryant to achieve the invention as presently claimed. Even if they are combined, they do not disclose or teach the invention as presently claimed. One of ordinary skilled in the art would not discern the present invention at the time of its invention. Therefore, the rejection under 35 U.S.C. § 103 has been overcome. Accordingly, withdrawal of the rejection under 35 U.S.C. § 103 is respectfully requested.

Having overcome all outstanding grounds of rejection, the application is now in condition for allowance, and prompt action toward that end is respectfully solicited.

Respectfully submitted,

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Enclosures:

Copies of priority document, substitute declaration, transmittal letter, and postcard submitted on July 29, 2004